REMARKS

Claims 1-6 are pending in this application. Claims 1 and 6 are in independent form.

Claim 1 has been amended to include the feature that the thickness profile is given to the resist mask by exposing the resist mask to a light wherein the resist mask is irradiated with a smaller quantity of light at its periphery than at its center and developing the irradiated resist mask. Support for this amendment is provided in the originally filed specification at page 4, lines 20-25.

New claim 6 is directed to a method of shaping a piezoelectric material comprising providing a piezoelectric substrate; applying a photoresist film onto the substrate; exposing the photoresist film to a light under the condition that the photoresist film is irradiated with a smaller quantity of light at its periphery than at its center; developing the irradiated photoresist film to form a resist mask having a thickness profile wherein the resist mask is thicker at its center and gradually becomes thinner toward its periphery; and dry etching the substrate together with the resist mask, thereby shaping the surface of the piezoelectric material substrate to a three-dimensional configuration corresponding to the thickness profile of the resist mask. Support for this new claim is provided in the originally filed specification at page 4, lines 14-25 and at page 5, lines 16-19.

Claims 2 and 3 have been cancelled.

No new matter has been added.

RESPONSE TO REJECTIONS

The present invention is directed to a method of shaping piezoelectric material to a predetermined configuration suitable for control of ultrasonic oscillation.

Claim 1 is rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent Application Publication No. 2002/0022292 to Barber et al. (hereinafter referred to as "Barber"). Claims 4-5 are rejected under 35 U.S.C. §103(a) as being unpatentable over Barber.

With respect to claim 1, the Office Action asserts that Barber discloses a method for shaping thin film resonators, the steps of which are summarized in Figure 3 of the patent publication. With respect to claims 4-5, the Office Action further asserts that Barber teaches that reactive ion etching may be used to remove the resist layer 25 and the substrate

layer 21 and varying the relative etch rates of the resist and the underlying material such that the initial resist shape is tailored to a desired final shape, for example, by changing the type of reactive gas used during reactive ion etching. In view of these teachings, the Office Action asserts that it would have been obvious to select the proper removal rate of the resist versus piezoelectric material including the case where the dry etching is started with a less selectively reactive gas for reforming the resist mask to a predetermined thickness profile and then continued with an etching gas having high selective reactivity to the piezoelectric material, because Barber teaches the broad concept of tailoring the etching steps to obtain a desired shape. As to claim 5, the Office Action notes that antireflective coatings are very well understood to be deposited films on the surface of the substrate prior to depositing the resist mask.

Applicants respectfully traverse the rejections for the following reasons.

Claim 1 and new claim 6 include the feature that the thickness profile is given to the resist mask by exposing the resist mask to a light wherein the resist mask is irradiated with a smaller quantity of light at its periphery than at its center and developing the irradiated resist mask. Barber fails to teach or suggest producing the thickness profile to the resist mask by these particular process steps. Barber teaches in paragraph [0028] that the photoresist is exposed and developed into "hockey-puck" cylinders 23 and then by using a heating schedule (heat at 80°C, then 150°C for 10 minutes at each temperature) these cylinders 23 are melted into dome-shaped "drops 24". Accordingly, Barber fails to teach the process steps of claim 1 which specifically state that the thickness profile of the resist mask is achieved by the exposure of the resist mask to a light for irradiating the mask with a smaller quantity of light at its periphery than at its center. Barber further fails to teach the process steps of claim 6 which include irradiating the photoresist film with a smaller quantity of light at its periphery than at its center and developing the irradiated photoresist film to form a resist mask having a thickness profile wherein the resist mask is thicker at its center and gradually becomes thinner toward its periphery.

In view of the amendments to the claims and the arguments set forth above, it is respectfully requested that the rejection of claim 1 under 35 U.S.C. §102(b) and the rejection of claims 4-5 under 35 U.S.C. §103(a) be withdrawn as Barber fails to anticipate and/or render obvious each and every feature of these claims.

CONCLUSION

Based on the foregoing remarks and amendments, reconsideration of the rejections and allowance of pending claims 1 and 4-6 are respectfully requested.

Respectfully submitted,

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